Organizations, Operations, and Officers
Databases Supporting NATO's Operations in Bosnia

Joseph Arsenault
Canuck Consultants

Long before the first Allied solider crossed the Sava River into Bosnia or the first air force crew person landed at Sarajevo Airport or the first maritime sailor debarked at the Split, Croatia seaport, databases were being used to plan, organize, track, and deploy Allied forces. This article presents a review of databases that support NATO's Implementation Force and Stabilization Force operations in Bosnia.

Highly sophisticated communication and information systems are being used in Bosnia to overcome command and control (C2) obstacles in an exacting environment. The principle has been to "move information, not people," according to Brig. Gen. James O'Neill, assistant division commander of the First Armored Division, which provided U.S. ground forces in Bosnia [1]. This article presents a brief overview of three database systems used by Allied forces in support of the Implementation Force (IFOR) and Stabilization Force (SFOR) in Bosnia. For example,

- The Pilot Joint Operations Command System (PJOCS) has a database to maintain command and staff work information for Joint Force Headquarters.
- Interim Allied Command Europe (ACE) Rapid Reaction Corps Information System (IARRCIS) provides field-based C2 for NATO's multinational rapid-reaction units using a client-server environment.
- The Maritime Command and Control Information System (MCCIS) shows a real-time maritime picture for the sea, land, and air. An advanced database has been implemented to store and manipulate ship and "track" information.

PJOCS

The PJOCS is a versatile, scalable, user-friendly, automated aid to command and staff work in the new Joint Command Structure centered at the Permanent Joint Headquarters (PJHQ) north of London, England. The PJHQ task is to command all overseas operations, including British participation in Allied operations.

PJOCS is a 50-terminal system based on commercially available software packages and equipment—either in workstations, which can be static or placed in transit cases for deployment worldwide or in laptops that send or receive reports to PJHQ over telephone lines. The new command structure includes two deployable Joint Force Headquarters (JFHQ) and PJOCS providing connectivity between PJHQ, JFHQ, and the three single-service component commanders. The system has been extended to the Ministry of Defense (MOD), Headquarters (HQ) Land Command, and HQ Strike Command. Two flagships will also be fitted with keel systems to ease the setting up of JFHQ Afloat for appropriate operations.

The basic attributes of the delivered PJOCS are listed in Table 1, including, most important, the ability to create and manage a Joint Operational Picture of the battlespace common to all users.

In addition to providing operational support to staff officers in PJHQ, JFHQ, and elsewhere, PJOCS also serves as a test bed for real users to evaluate information technology techniques and procedures that can be translated into the operational requirement for the next evolution phase of a Joint Command System. For the Joint Warrior Interoperability Demonstration 1996, PJOCS was proven in a network scenario that represented command of an overseas operation. PJOCS also achieved new high-level interoperability with the IARRCIS and the U.S. Global Command and Control System.

IARRCIS

IARRCIS is a flexible, rugged, simple-to-use C2 information system (CCIS)

Table 1. *PJOCS attributes.*

Attribute	Product
Mapping and Operational Picture	Manged by INR Nauticus, using digital maps provide by United Kingdom military survey.
Office Automation	Applixware word processing, graphics, and spreadsheet.
Military Messaging	Systematic IRIS for NATO's Allied Data Publication (ADatP-3).
Databases	Oracle RDBMS with Jane's and classified defense data.
Systems Management	Sonnet Manager, SUN E-mail, and Tivoli.
Interfaces	Link 11.
Hardware	SUN Sparc5s, supplemented by Tadpole Laptops.
Imagery	Diets.
Conferencing	Shared Apps Whiteboard for visual and audio conferencing.

The contents of this article are not necessarily the views of the North Atlantic Treaty Organization (NATO), Supreme Headquarters Allied Powers Europe, or the governments associated with NATO.

originally designed for NATO's multinational HQ ACE Rapid-Reaction Corps (ARRC). The ARRC system supports over 200 HQ staff users who can operate from several locations, i.e., forward and rear HQs, and over 100 liaison officers attached to the ARRC's participating national and multinational divisions. IARRCIS may also be used in barracks with commercial non-Tempest equipment, which provides a common operational and nonoperational environment.

Soon after the first equipment came into use with the ARRC in 1995, MOD United Kingdom saw that IARRCIS could also usefully serve a similar C2 function in the British army and therefore ordered additional IARRCIS systems for national use. Currently, the majority of operational Army HQs and the Royal Marines are IARRCIS equipped.

IARRCIS is designed as an infrastructure system that links local- and wide-area networks with a robust X.400 messaging system that uses Windows, DOS, and UNIX platforms. Integrating Microsoft Office productivity tools, together with an Oracle client-server environment for strategic user applications, the system effectively meets operational information requirements. Attributes of IARCCIS are listed in Table 2.

IARCCIS has proved to be highly successful in both national and NATO operations, including the increasing number of peacekeeping operations in which British and Allied forces are involved. IARRCIS saw operational use in Bosnia at IFOR's land HQ, assigned British units, and a forward maintenance unit in Split, Croatia.

Attribute	Product
Network Computer	European Data Systems EXI Intel 486 with Pentium upgrade in later versions; Alpha and Sparc also available.
Liaison Computer	European Data Systems LXI Intel 486; Alpha available.
Sparc Server	Lynwood Explorer II Sparc 20 to complement EXI in more processor-intensive roles.
Printer and Tape Backup	HP Deskjet and Wang respectively, both in XL Computing rugged cases.
Messaging	Nexor X.400 and X.500, including Systematic IRIS ADatP-3.
Office Automation	Microsoft Office.
Communications Interfaces	X.25 Ptarmigan.
Database	Oracle.
System Management	Sunset Manager and Procom+.

Table 2. *IARRCIS attributes.*

MCCIS

The major and subordinate commands of NATO are responsible for various tasks involved with the planning and executing of maritime military actions that support the overall objectives of NATO. Because of the large volume of data used to support command decisions, information systems have become a necessity in maintaining, manipulating, and exchanging this maritime information. MCCIS provides this support for Supreme Allied Commander, Atlantic and other commands throughout NATO such as the Supreme Headquarters Allied Powers Europe (SHAPE).

MCCIS allows commanders and their staff to automatically receive, analyze, display, and manipulate data. This capability helps commanders make more accurate, timely decisions. The system includes

- Open architecture design based on the UNIX Operating System and TCP/IP for easy communication with Macintosh and PCs as well as Web access.
- A large relational database (Oracle) and associated data display and manipulation capabilities.
- A broad geographic capability that can automatically display and update important position information.
- Message drafting and review and release assistance for outgoing messages.
- A message distribution, parsing, and filing capability for incoming messages.
- An electronic mail capability between local and remote users.
- A word processing, graphics, and spreadsheet package.
- A unique briefing tool that allows users to synthesize and display up to four different briefings simultaneously on any computer in the world with which MCCIS can communicate.
- Collaboration tools for multiparty whiteboard communication to other headquarters.
- Secure file and data transfer, which maintains maximum security, within the MCCIS.
- HyperText Markup Language-based tutorials and documentation for use locally, over a classified network, or on the Web.

MCCIS was created using the concept of evolutionary development and the principles of open architecture design. This means that the system is an evolving blend of commercial-, government-, and NATO-off-the-shelf (COTS, GOTS, NOTS) information technologies tailored to meet unique MCCIS requirements. The architecture of the system is based on the U.S.-developed Joint Maritime Command Information System (JMCIS). JMCIS is designed around COTS products such as X-Windows, Motif, and UNIX. Table 3 provides an overview of the technology packages currently integrated into MCCIS.

Future Trends

NATO has gained significant field experience over the last two years in Bosnia in deploying information and communication systems for future peace-keeping, peace-enforcing, and crises management operations. A short list of these future trends include

Attribute	Type	Product
Hardware	COTS	Hewlett Packard server running HP UNIX
Terminals	COTS	UNIX workstations, PCs, and Macintoshes with X-Server software
Office Tool	COTS	Applixware
Database	COTS	Oracle
Data Display and Manipuliation	NOTS	CASE tool
Multisite Briefing	NOTS	Briefing Tool
Formatted Message Processing	COTS	Systematic IRIS
HTML Browser	COTS	Netscape
Application	GOTS	Waterspace Management

Table 3. *MCCIS attributes.*

- Data Fusion – With an extensive number of disparate information systems with different methods to store and maintain data, the need for seamless data fusion is of critical importance. Current methods using cut and past will not meet the requirement for real-time systems. For example, data from logistics systems would have to be manually manipulated and transferred to a force-planning system. Data fusion would alleviate this time-consuming problem by reducing potentially dangerous information-loss situations for the warrior.
- Multinational, Multicultural, Multilingual – Future CCISs will require technologies that can present information that meets the needs of user communities. Systems will have to be able to present and handle data in multiple language formats. Additionally, system interfaces will have to be developed that address the unique military and civilian "cultural" environments of users. National language support options directly tied into CCISs assist in this area.
- Standardization – The need for products, both hardware and software, that conform to standards will be paramount for future operations. Gone are the days when CCISs would be developed and used in a vacuum. Systems need to interoperate, and these systems must meet standards. Commercial standards and COTS products are replacing stovepipe military requirements. Relational Database Management System vendors are providing database tools that operate on large cross section of platforms and operating systems.
- Internet, Intranets, and Browsers – You could argue that the Bosnia conflict was the first "Web war." The use of the Internet and Web technologies was prevalent by all the warring parties involved. NATO has made extensive use of Internet resources. They also are about to implement a number of private, secure Intranets at both permanent and deployed HQs. Using browsers has greatly improved the training time for the "not as technically advanced" participating countries in IFOR and SFOR. Using browser front-ends for access to databases and CCISs has given NATO a cost-effective solution to information access across their span of command. Database servers and Web technologies are being explored and exploited in a number of diverse areas.

Conclusion

NATO has shown that the database systems discussed in this article and in other sources have been a force multiplier for its operations in Bosnia. News reports and briefings make the installation and maintenance of these CCISs appear almost effortless—a mere exercise in connecting the dots [1]. In reality, the success of the C2 infrastructure, used by NATO in Bosnia operations, owes as much to human ingenuity and perseverance as it does to the technology. Military and civilian information technology specialists are continuing to contend with bitter cold, mud, and bombed-out urban environments while maintaining a robust CCIS network from a collection of strategic, tactical, and commercial systems. The work of these individuals from over 30 nations and their CCIS databases has truly "implemented and sustained the peace." ◆

About the Author

Joseph Arsenault has more than 10 years extensive in-depth experience in database design and implementation in international environments. He is an independent database technologist supporting a number of defense and government sector projects. He was a former NATO civilian employed at SHAPE, Belgium. He was the SHAPE project manager on the ACE Deployable Command and Control System project, which has been designated as an asset of NATO's Combined Joint Task Force. He has a bachelor's degrees in economics and in information systems management.

Canuck Consultants
43025 Ellzey Drive
Ashburn, VA 20148
Voice: 301-213-5631
E-mail: arsenaul@compuserve.com

Reference

1. "Special Report: Bosnia," *Federal Computer Week*, April 29, 1996.

Web Sites

1. NATO http://www.nato.int/ifor/ifor.htm
2. SHAPE http://www.shape.nato.int/frm_sfor.htm
3. PJOCS http://www.official-documents.co.uk/document/mod/defence/c4tx1.htm#6
4. IARRCIS http://www.kable.co.uk/eds/iarrcis.htm
5. MCCIS http://www.saclant.nato.int/mccis/index2.htm